A Novel Database-Driven Approach to Shallow Marine Classification: Towards Building a Knowledge Base

Vakarelov, Boyan [1]; Ainsworth, Bruce [1]; Nanson, Rachel A.[1] (1) Australian School of Petroleum, Adelaide, SA, Australia.

Classification systems that are widely used in sedimentary geology meet the following criteria: (i) they are relatively simple and based on a limited number of variables; (ii) they tend to be shown as two dimensional diagrams; (iii) they attempt to resolve a practical problem. The output of these classifications is placing the variability of the natural world in discrete categories, which ideally show sufficient commonality in properties and behavior. Since shallow marine systems are often described on basin and local scales, different classification systems are applied to the same package of rock. Sequence stratigraphy, which can be thought of as a classification system based on accommodation change and sediment supply as input variables and systems tracts as output categories, tends to be applied to studies examining basin-scale modes of deposition. Studies focused on local facies variability, on the other hand, usually take a depositional systems approach. They use one of several available process-based classifications, based on waves, tides, and fluvial sediment supply as key variables, and process domination as output categories. Use of separate classification schemes for basin-scale and local deposition deals poorly with the often existing co-dependence between the two.

We propose a new classification scheme for shallow marine systems which utilizes a database-driven approach. In comparison to conventional paper-based classification schemes, database-driven classification can handle numerous variables without compromising ease of use. The new classification system is based on variables that are measurable in the ancient record: (i) wave facies influence (ii) tide facies influence, (iii) fluvial facies influence, and (iv) local accommodation (near-shore water depth)—related to parasequence thickness, (iv) grain size. Local accommodation, which has not been previously incorporated in classification schemes, is added because of its first order importance on wave and tide energy, rate of shoreline progradation, and degree of preservation of fluvial influence. The classification can also be enhanced by other variables such as basin type and shelf width. The classification scheme then places the observed depositional systems in distinct categories with assigned primary (e.g., wave-dominated) and a secondary (e.g., tide-influenced) descriptors. The proposed classification scheme is part of a shallow marine knowledgebase currently under development.